ANNUAL REPORT

1962

CITY OF STRATFORD

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ON

THE CITY OF STRATFORD

SEWAGE TREATMENT PLANT

OWRC PROJECT - 57-S-2

STRATFORD SEWAGE TREATMENT PLANT

OPERATED FOR

THE CITY OF STRATFORD

BY

THE ONTARIO WATER RESOURCES COMMISSION

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Prepared by the
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STRATFORD SEWAGE TREATMENT PLANT

GENERAL

The Activated Sludge Treatment Plant in Stratford was completed and put into operation in August of 1930. Treatment consisted of screening, aeration and final sedimentation. The sludge produced was stored in sludge storage beds. It was pumped from these beds to trucks from which it was spread on farm land.

The design capacity of the plant was only 2.5 MGD and, as a result, in June, 1958 the plant was extended. The aeration section of the old plant was retained and the old final sedimentation tanks were converted to aeration tanks. Four primary and two secondary clarifiers were added as well as grit removal equipment and a digester.

The new plant is designed to treat a normal dry weather flow of 4 MGD and flows up to 8 MGD for short periods. Primary treatment alone can be given to sewage up to a flow rate of 16 MGD.

DESIGN DATA

The new 4 MGD sewage treatment plant was designed by Canadian-British Engineering Consultants, Toronto. Schwenger Construction Company Limited of Hamilton were the main contractors on this project. Cost of the new plant was $927,382.

(1) Inlet Works:

On entering the plant site, the two concrete inlet sewers 30" and 48" diameter discharge into a channel which conveys the sewage flow to the screening chamber inside the machinery house. This

channel is fitted with a storm overflow weir over which all flows in excess of 16 MGD are taken direct to the head of the effluent outfall pipe and to the Avon River.

(2) Screening:

The screening chamber is divided into two parallel channels in one of which is installed a "Barminutor" or bar screen having 1" spacing between bars and provided with a cutting device which mascerates any material retained on the screen. This is designed for flows up to 12 MGD, but is capable of passing flows up to 16 MGD for short periods.

The second channel is of the same dimensions as the first and functions mainly as a by-pass should it be necessary at any time to close the first channel for maintenance. It is fitted with a bar screen which is cleaned by hand rake when necessary. Either channel may be closed off by two handstops.

Provision is made for the installation of a second "Barminutor" mechanism in the second channel in the future when flows of over 12 MGD occur frequently. When this is done the two channels would normally both be in use in parallel.

(3) Detritus Removal:

After screening, the flow passes to a Dorr Detritor which consists of a grit settling tank with a collecting mechanism and a grit cleaning mechanism.

The settling tank is of a sufficient capacity to settle out 90% of grit coarser than 65 mesh when receiving the maximum flow of 16 MGD. At lower flows, some organic matter will also settle.

The grit, after being collected by the mechanism into a side hopper, must, therefore, be freed from this organic matter. This is done by a cleaning mechanism which also acts as an elevator and discharges the cleaned grit into a barrow in the grit dis-change house.

The effluent weir of the grit settling tank is used for measuring and recording the flow receiving primary treatment.

(4) Primary Sedimentation:

From the detritor, the flow passes out of the machinery house through a covered channel to the distribution chamber for four circular primary sedimentation tanks 80 feet in diameter. The distribution is so arranged that flows up to 8MGD may pass to one pair of tanks only. This allows the other pair to be kept empty ready to receive flows in excess of 8 MGD, i.e. storm flows, when these occur. The object of this is that the flow resulting from small storms of short duration may be very largely, if not entirely, held in these storm tanks and little or no discharge of storm water to the river need occur. The contents of these storm tanks are pumped back for full treatment when the rate of flow into the plant has sufficiently diminished. The arrangement is very flexible and the whole flow can be directed to any or all of the tanks at any given time. Two hours detention of 16 MGD is provided, using all four tanks.

The four tanks are identical with centre inlet and peripheral overflow channels discharging by way of a common effluent culvert, located under the influent channel to the main pump sump in the machine

house. The tanks are substantially flat bottomed and are provided with desludging and skimming mechanisms. Sludge and scum are discharged by way of a common pipe to the sludge pumps in the machinery house.

(5) Aeration Section:

The effluent from the primary sedimentation tanks is raised by the main sewage pumps from the main pump sump and discharged to the aeration section. These pumps are controlled by the level in the sump and will pump a maximum of 8 MGD. If the flow exceeds this rate, the level in the sump will rise and the excess flow will pass over a weir directly to the effluent outfall pipe and so to the river.

The flow of up to 8 MGD thus pumped for full treatment enters the returned activated sludge re-aeration channel where it is intimately mixed with activated sludge. It then passes by way of a distribution channel to the aeration tanks which provide five hours retention on 4 MGD flow. The aeration tanks each take the form of a three-pass channel discharging flow to a mixed liquor channel at the opposite end of the aeration plant.

While in the aeration tanks and the distribution and mixed liquor channels air is introduced to the flow through porous air diffuser domes, which are supplied by three air compressors located in the machinery house. Each compressor is capable of delivering 1750 cubic feet per minute of free air at 7 pounds per square inch.

(6) Final Sedimentation:

From the end of the mixed liquor channel, the flow passes to a distribution chamber and thence to two final sedimentation tanks in parallel. These are 80 feet in diameter and give two hours detention on maximum flow of 8 MGD. They have centre inlets and peripheral overflows and are fitted with mechanisms which discharge the settled sludge from outlets at the centre of each tank.

From these outlets, the settled activated sludge is forced by hydrostatic head through 12" diameter pipes to the activated sludge sump in the machinery house. Here it is raised by two variable speed pumps, a portion being returned to the re-aeration channel for use in the aeration section and the remainder passing to the inlet channel to the primary sedimentation tanks for removal with the primary sludge.

(7) Sludge Digestion:

Sludge from the primary sedimentation tanks, which will also contain the scum from these tanks and the excess activated sludge, is pumped by positive displacement plunger pumps to the sludge digestion tank.

This tank, which has a fixed concrete roof, is 73 feet in diameter, 26 feet deep and has a sludge capacity of 100,000 cubic feet. It is divided by a cylindrical partition wall into two compartments in order to provide digestion in two stages. The centre compartment has a capacity of 67,500 cubic feet for first stage or active digestion and the annular compartment which surrounds the first is of 32,500 cubic feet capacity for second stage,

or quiescent digestion and also affords insulation for the first stage compartment which is heated. The partition wall extends from the bottom of the tank to the roof, but has openings above the sludge level so that the gas storage space extends over the whole area of the tank.

Four hot water pipe coils are located at the centre of the tank and sludge is fed into the tank through the roof between these coils. Compressed digester gas is blown into the bottom of the tank below each coil in order to produce a flow of sludge upward around the heating coils and so ensure uniform heating of the sludge tank contents and an intimate mixing of the raw sludge feed with sludge which is already digesting. Compressed gas may also be blown into the bottom of the first stage compartment at eight other points to assist in thorough agitation and mixing of the whole contents.

A curtain wall is provided connecting the outer wall of the tank to the cylindrical partition wall at one point. On one side of this wall there is a port connecting the first stage compartment with the second stage at floor level and, on the other side, the digested sludge draw-off pipe passes out through the outer wall of the tank and up to a visual draw-off trough in the control room. The gradual passage of sludge along this channel is assisted by compressed gas which can be blown into the bottom of the tank at 16 points below inclined baffles.

Overflow, sampling and supernatant draw-off pipes pass through the outer wall of the tank from the outlet end of the second com-

partment into the control room which is located on the top floor of the digester building. On the lower floor of this building are the gas compressors. Below this is a pipe basement. The boiler fired by sludge gas is located in the machinery house. Digester overflow and supernatant water gravitates to the primary sedimentation tank effluent pipe and is pumped by the main pumps to the aeration plant.

(8) Sludge Disposal:

The digested sludge is drawn off through the digester control house to the sludge day tank, located with the sludge pumping station and sludge storage bed. During normal operation, sludge will be pumped direct from this day tank into tank trucks for disposal on farm land. During the winter or other times when sludge cannot be disposed of on farm land, the digested sludge will flow from the day tank into the sludge storage bed from which it may be pumped at a later date through the day tank. Alternatively, it may be possible to dispose of a portion of the sludge on the remote parts of the site.

OPERATING RESULTS

(1) Loadings and Removals:

There was a drop in flow this year from 933.41 million gallons in 1961 to 765.39 million gallons. The corresponding average daily flow decreased from 2.5 million gallons in 1961 to 2.1 million gallons this year. The total 24 hour flows ranged from a maximum of 8.90 million gallons in March and to a minimum of 0.75 in October. It was found that between 5 and 99 percent of the

time the daily flows were between 18 and 100 percent of the design flow. The design flow is 4 million gallons per day. It is interesting to note that 50 percent of the time the daily flows were equal to or greater than 50 percent of the design flow. During the year, the maximum surge which went through the plant was at a 17 million gallons per day rate in November and the absolute minimum flow rate was 0.3 million gallons per day and occurred in August and November. It was necessary to bypass the plant for only 7 hours during the year because of high flows.

There was on an average a decrease in strength of sewage as well as flow this year compared to 1961. On an average, the BOD and SS were 251 ppm and 259 ppm respectively compared to an average BOD and SS last year of 311 ppm and 267 ppm respectively. The closing down of one of the major meat packing plants was largely responsible for the reduction of the sewage strength. Between 5 and 95 percent of the time the BOD was between 160 ppm and 390 ppm and the suspended solids were between 140 ppm and 420 ppm. This indicates that the plant must cope with a large range of sewage strengths.

Complete treatment resulted in a BOD reduction of 95 percent or better and a suspended solids reduction of 93 percent or better half of the time. This represents a high degree of efficiency with respect to BOD and suspended solids removal and results from careful operation. The lower efficiency with respect to suspended solids removal resulted from the inflexibility of the aeration section. As was indicated before, the plant had

to treat a large range of sewage strengths; therefore, it was necessary to carry enough activated sludge (living matter) in the aeration section to handle the higher concentrations of BOD that occurred. As a result, during periods of low concentration, there was too much activated sludge and there was a tendency for some of the activated sludge to "die" with a resulting increase in suspended solids in the effluent. However, the resulting suspended solids in the effluent are quite stable (well oxidized) and have a low BOD concentration.

The flow and grit, BOD and suspended solids removal records are shown on Tables I and II.

TABLE I

FLOW RECORDS MGD

MONTH	ABSOLUTE MAXIMUM	ABSOLUTE MINIMUM	MAXIMUM 24 HOUR FLOW	AVERAGE 24 HOUR FLOW	MINIMUM 24 HOUR FLOW	TOTAL MONTHLY FLOW MG	PLANT BYPASS (HOURS)
JANUARY	5.8	0.5	2.94	2.1	1.32	64.38	NIL
FEBRUARY	5.4	0.9	3.75	2.1	1.35	57.47	NIL
MARCH	12.0	0.9	8.90	4.6	1.82	143.53	NIL
APRIL	14.0	1.0	4.61	2.8	1.50	84.67	NIL
MAY	13.8	0.9	3.49	2.1	1.22	63.64	NIL
JUNE	17.0	0.9	3.38	2.1	1.12	61.54	0.33
JULY	17.0	0.8	2.81	1.5	0.85	46.07	0.50
AUGUST	13.8	0.3	3.64	1.4	0.85	41.88	1.17
SEPTEMBER	14.0	0.8	2.19	1.4	0.88	43.95	NIL
OCTOBER	16.5	0.4	3.53	1.6	0.75	47.92	NIL
NOVEMBER	17.0	0.3	7.44	1.7	0.85	50.76	4.0
DECEMBER	4.2	0.5	3.29	1.9	1.15	59.58	NIL
TOTAL						765.39	7.0
AVERAGE PER MONTH	12.5	0.7	4.16	2.1	1.14	63.78	0.58

NOTE:

1. MGD - Million gallons per day.
2. MG - Million gallons.
3. The flow meter was found to be inaccurate at low flows.

TABLE II

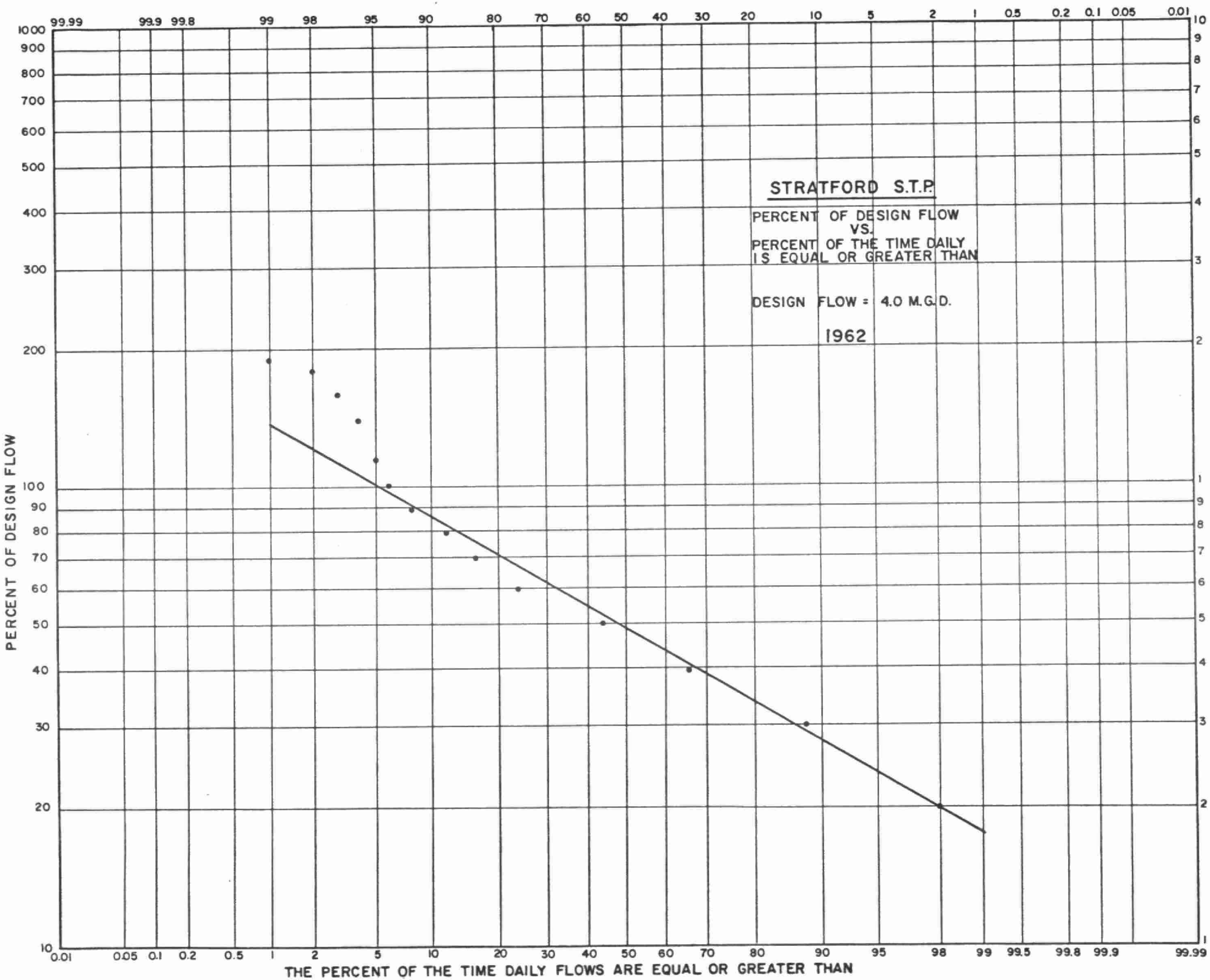
GRIT, BOD AND SS

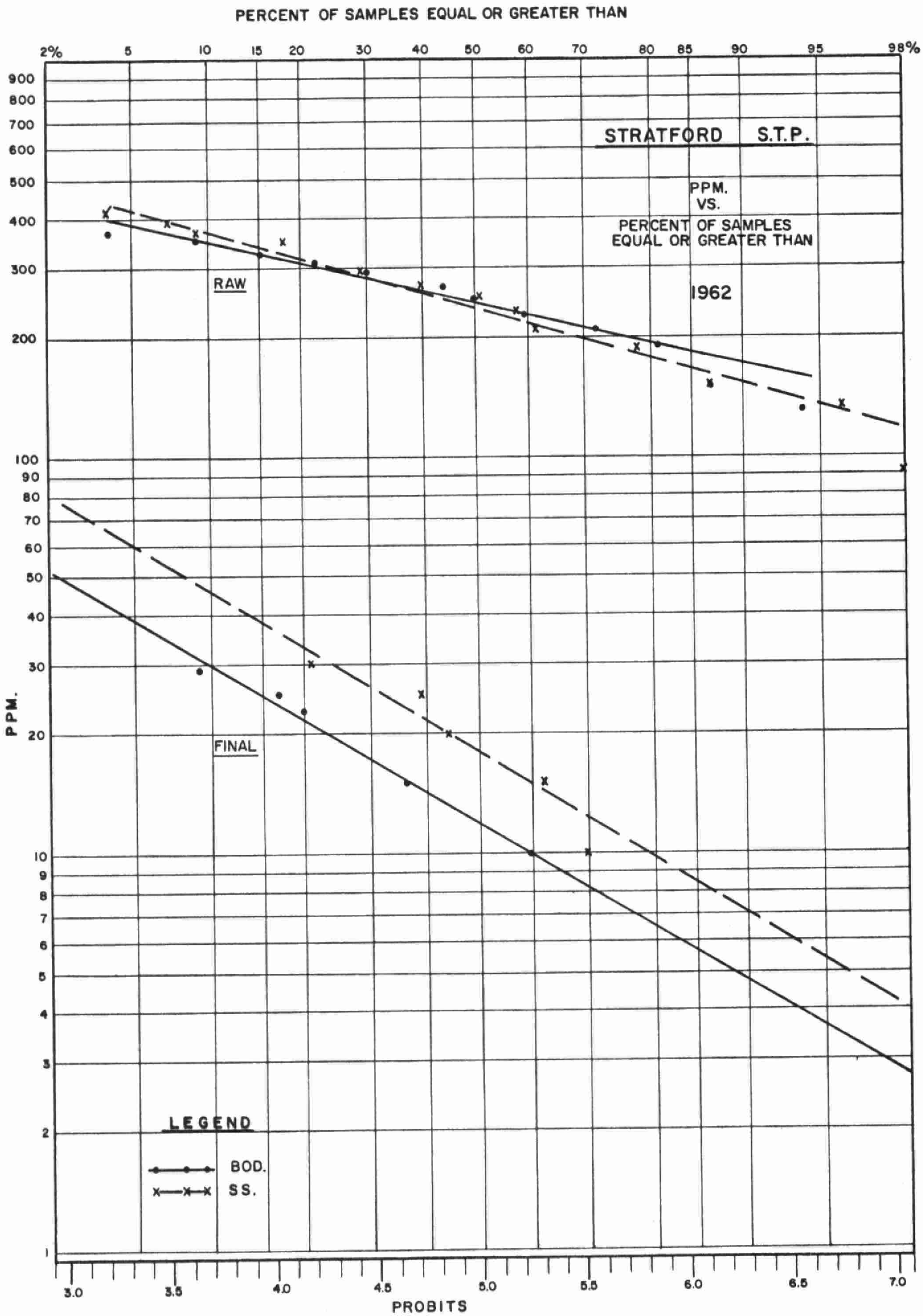
REMOVAL

MONTH	BOD				SS				GRIT REMOVED CU. FT.
	INFLU.PPM	EFFL.PPM	% REDCTN.	TONS REMOVED	INFLU.PPM	EFFL.PPM	% REDCTN.	TONS REMOVED	
JANUARY	344	11	97	107.1	328	23	93	98.2	164
FEBRUARY	289	12	96	79.6	254	35	86	63.0	13
MARCH	153	5	97	106.1	177	36	83	101.1	64
APRIL	294	7	98	121.5	263	28	89	99.7	88
MAY	243	8	97	74.8	205	30	85	55.7	139
JUNE	198	13	93	56.9	163	5	97	97.2	146
JULY	239	15	94	51.6	238	5	98	53.7	183
AUGUST	291	11	96	56.2	304	27	91	55.6	72
SEPTEMBER	238	8	97	50.6	360	14	96	76.1	49
OCTOBER	258	23	91	56.6	297	16	95	66.4	69
NOVEMBER	226	24	89	50.7	240	14	94	56.6	220
DECEMBER	238	24	89	63.0	279	19	93	77.3	67
TOTAL				874.4				900.6	1274
AVERAGE PER MONTH	251	13	95	72.9	259	21	92	75.1	106

NOTE:

1. BOD - Biochemical oxygen demand.
2. SS - Suspended solids.
3. ppm - Parts per million.


STRATFORD S.T.P.
PERCENT OF DESIGN FLOW
VS.
PERCENT OF THE TIME DAILY
IS EQUAL OR GREATER THAN
DESIGN FLOW = 4.0 M.G.D.
1962
PERCENT OF DESIGN FLOW
THE PERCENT OF THE TIME DAILY FLOWS ARE EQUAL OR GREATER THAN


PERCENT OF SAMPLES EQUAL OR GREATER THAN
STRATFORD S.T.P.
PPM.
VS.
PERCENT OF SAMPLES
EQUAL OR GREATER THAN
1962
RAW
FINAL
PPM.
PROBITS
LEGEND
BOD.
SS.

(2) Aeration Section

The operating performance of the aeration section of the plant is indicated on Table III. The effluent from the primary clarifier to the aeration section is less in concentration than the raw sewage and does not vary as greatly in strength. However, there is still considerable range in strength which must be dealt with by this section of the treatment plant.

The aeration section is responsible for approximately 50 percent of the BOD removal experienced throughout the plant. A considerable volume of air is required for this removal and it is supplied by three 75 HP air blowers.

Table III indicates that on an average 2550 cubic feet of air were required for each pound of BOD which was removed during the year. It should be noted that this is larger than the recommended range of around 1,000 cubic feet of air per pound of BOD removed. It occurred because two blowers were run in the afternoon when the sewage load to the plant had increased in order to maintain a dissolved oxygen content higher than 2 ppm in the aeration section. The result was that the dissolved oxygen content increased to 4 or 5 ppm which is beyond the recommended criterion of 2 to 3 ppm. This means only a partial amount of the second blower's capacity was needed, but as the blowers only run at design speed, the full capacity of the blower had to be utilized.

TABLE III

AERATION SECTION

MONTH	PRIMARY EFFLUENT B.O.D. (PPM)	M.L.S.S. PPM	LBS. BOD PER 100 LBS. MLSS	B.O.D. REMOVED (TONS)	CU. FT. AIR PER LB. BOD REMOVED	CU. FT. AIR PER GAL. SEWAGE
JANUARY	168	2,568	15	50.6	1,260	2.3
FEBRUARY	173	2,480	16	46.2	1,250	2.1
MARCH	51	2,552	10	32.9	1,720	0.9
APRIL	126	2,679	18	50.5	1,110	1.5
MAY	116	2,491	10	34.4	1,840	2.0
JUNE	94	2,593	9	24.9	2,760	2.3
JULY	81	2,380	5	15.2	4,100	2.5
AUGUST	92	2,288	5	16.3	4,060	2.8
SEPTEMBER	127	2,319	9	26.2	2,560	2.7
OCTOBER	121	2,570	7	23.2	3,280	2.7
NOVEMBER	114	2,634	8	22.6	3,646	2.4
DECEMBER	102	2,515	10	23.2	3,018	2.1
TOTAL				366.2		
AVERAGE PER MONTH	114	2,506	10	30.5	2,550	2.2

NOTE:

1. PRIM. EFF. - PRIMARY EFFLUENT
2. MLSS - MIXED LIQUOR SUSPENDED SOLIDS IN THE AERATION TANK
3. BOD - BIOCHEMICAL OXYGEN DEMAND
4. PPM - PARTS PER MILLION

(3) Digester and Sludge Disposal

Table IV shows the loading and operating results experienced with the handling of sludge at the plant. A total of 2.55 million gallons of sludge was pumped to the digester this year which represents a 15 percent reduction in volume compared to last year. The sludge is heated to about 90 degrees Fahrenheit and the volatile matter is decomposed at this temperature. The formation of gas (primarily methane) results from this decomposition. This gas is utilized to heat the digester and the buildings at the plant. The sludge after decomposition is removed from the digester and taken by tank truck to be spread on farm land.

TABLE IV

DIGESTER OPERATION, SLUDGE DISPOSAL
AND FUEL OIL USED

MONTH	SLUDGE TO DIGESTER				GAS PROD. CU. FT. (1,000)	SLUDGE HAULED CU. YD.	FUEL OIL (GALS.)	
	GAL.	% SOLIDS	LBS.	% VOL.			AERATION	BOILER ON OIL
JANUARY	224,681	5.0	112,000	78	712.9	182	558	NIL
FEBRUARY	194,413	4.8	93,200	75	582.6	476	352	26
MARCH	233,682	4.3	100,000	68	614.9	1379	166	NIL
APRIL	222,540	7.3	164,000	58	735.2	2047	368	NIL
MAY	233,667	6.4	149,000	68	580.7	1925	383	NIL
JUNE	224,815	6.3	142,000	61	630.6	2051	260	NIL
JULY	246,014	5.8	142,000	64	536.8	1995	187	NIL
AUGUST	234,892	6.6	155,000	69	588.2	1491	220*	NIL
SEPTEMBER	139,241	5.8	80,600	70	344.8	798	299	NIL
OCTOBER	234,276	5.6	131,000	71	559.3	1106	246	NIL
NOVEMBER	180,893	6.5	117,500	65	534.1	1603	368	NIL
DECEMBER	182,861	6.3	115,200	69	605.5	245	182	NIL
TOTAL	2,551,975		1,501,500		7025.6	15298	3589	26
AVERAGE PER MONTH	212,664	5.9	125,125	68	585.5	1274	300	2

* 41 quarts of defoamant were used from August 1 to August 11

NOTE: Vol. - volatile matter.

OPERATIONS

A considerable amount of painting was carried out during 1962. The digester, digester control room, basement floor of the pump and blower room, pump and blower room and floor and the boiler room were painted under a contract. Further painting will be done next spring on the interior of the two valve houses to complete the contract.

Water and mud were discovered in the 1,000 gallon underground storage tank in June. It was dug up in September and was found to have numerous pinholes and other evidence of corrosion. As a result, it was replaced with a new one. The old one was sold for $8.00.

In August, the accuracy of the Kent meter was inspected by allowing the sewage to flow through the meter unit and into an empty primary clarifier. The flow was timed over a 4 foot change of depth in the primary clarifier and the integrator was read at the beginning and end of the time interval. It was found that neither the integrator nor the transmitter agreed with each other or the actual flow through the meter unit at low flows. The integrator was found to be very accurate at high flows. Canadian-British Engineering and George Kent Meters Ltd. were informed and an inspection was made by George Kent Meters Ltd. It was found that the gears installed in the transmitter, associated with the float were not the proper type. The new gears will be installed in 1963 and the meter recalibrated. It should be noted that all the flows in this report are as read by the flow meter as the correction factor is not known as yet.

Mr. C. Biggin has been conducting sewage treatment classes with his operators every 2 weeks on a Wednesday from 7 to 9P.M. The first class began on November 21.

OPERATORS

Two new operators were hired this year to replace the vacancies left by Mr. C. Biggin, who was promoted to Chief Operator in October 1961, and Mr. A. MacMillan, who resigned in December 1961. Mr. J. Craig was hired in January and Mr. R. Ranton was hired in June. This brought the total number of operators up to five, plus a chief operator. The other operators during the year included Messrs. C. Biggin (Chief Operator), W. McManus, J. Gotts and J. Meldrum. Twenty-four hour supervision of the plant was afforded by the above staff. A casual labourer was also employed for much of the year to aid in cutting grass, painting and other duties.

SERVICING OF PROJECT BY HEAD OFFICE STAFF

The plant was inspected at least once a month by a project engineer. Some of the more important work supervised by head office included the hiring of new operators, investigating the possibility of obtaining a supernatant from the digester, painting the plant and correcting the inaccuracy of the Kent flow meter. The plant performance was reviewed continually by the project engineer to ensure that the plant was running at its maximum efficiency.

The plant is checked once a year by the Division of Sanitary Engineering to ensure that the plant is producing the best effluent possible. Also the equipment is inspected at least once a year by the OWRC technical staff. Extra work done by the OWRC technical staff during the year included vacuum cleaning of electrical equipment and power panels, repair of the travel chain on the barminutor, replacing of bearings on the primary clarifier, repair of the flow meter casing, cleaning electrodes of pump controls, repair of activated sludge return pump, repair of controls on the main sewage pumps, repair of the grit rake motor, surveying and obtaining estimates for the relocation of hydro service for the overhead power supply, checking the power feed lines between the transformer and power panel for ground and the inspection of the Kent meter and flow to aeration meter.

There was also considerable work done in the Statistical, Purchasing and Payroll Departments and in the OWRC Laboratory pertaining to the plant.

The Statistical Department calculates and records all the operating data available. They also record all the insurance premiums and their cost for the plant.

The Purchasing Department buys all the items over 10 dollars which have been ordered by the project engineer and approved by the OWRC. They purchased 93 sets of items during the year for the plant.

Payroll, pension and Workmen's Compensation for the operators are handled by the Payroll Department.

Samples of raw sewage, primary effluent and final effluent were sent to the OWRC Laboratory once a week. There BOD, total solids, suspended solids, dissolved solids and chromium analyses were performed on the raw sewage, primary effluent and final effluent. The results of the tests were sent to the chief operator and to head office.

OPERATING EXPENSE DATA

The budget exceeded the actual expenditures by $6,842.04. Below is a chart which lists the budget, the actual expenditures and the difference between the two for each separate item. A plus sign under the difference column indicates that the actual expenditures were less than the budget and a minus sign indicates that the budget was exceeded.

ITEM	1962 BUDGET	1962 ACTUAL	DIFFERENCE
Payroll	30,500	26,833.24	+ 3666.76
Fuel	800	1,036.75	- 236.75
Power	5,900	4,998.32	+ 901.68
Chemical	480	141.91	+ 338.09
General Supplies	3,000	2,796.88	+ 203.12
Equipment	800	674.30	+ 125.70
Repair & Maint.	800	1,311.59	- 511.59
Sludge Haulage	9,400	7,840.00	+ 1560.00
Sundry	1,300	1,976.42	- 676.42
Water		548.55	- 548.55
Contingency -4%	2,020		
	55,000	48,157.96	

PAYROLL

Budget - $30,500   Actual - $26,833.24   Difference - +$3,666.76

The major reason the budget exceeded the actual expenditures was that $3,900 was allowed for the salary of an extra operator. However, it was found during the year that this extra operator would not have to be hired. The salaries of C. W. Biggin and J. Craig were raised from $4,200 to $4,400 in April and from $3,600 to $3,750 in August respectively.

FUEL

Budget - $800   Actual - $1,036.75   Difference - -$236.75

Fuel oil is used for foam control and to supplement the fuel to the boiler when needed. The deficit of $236.75 is due to the difficulty in estimating the fuel required for foam control.

POWER

Budget - $5,900   Actual - $4,998.32   Difference - +$901.68

The estimate of $5,900 was based on the power bill for 1961. The average BOD dropped from 311 ppm in 1961 to 251 ppm this year and was accompanied by a corresponding drop of flow from 933.41 million gallons in 1961 to 762.37 million gallons this year. The result of the drop in sewage strength and flows was that fewer blowers were required. As blowers are one of the major consumers of power in the plant, the reduced hours of operation account for the $901.68 difference between the budget and the actual expenditure.

CHEMICALS

Budget - $480 Actual - $141.91 Difference - +$338.09

Items purchased include lab chemicals, filter paper, paint ($17.69), defoaming agent ($33.44) and one drum of polycide ($54.38).

GENERAL SUPPLIES

Budget - $3,000 Actual - $2,796.88 Difference - +$203.12

General supplies purchased include miscellaneous hardware items, paper towels, general flow meter supplies, pump packing, bearings, floor polish and electrical supplies.

EQUIPMENT

Budget - $800 Actual - $674.30 Difference - +$125.70

Equipment purchased include a double travel chain for the barminutor ($103.55), a General Electric motor frame ($80.34), a rotary power lawn mower ($75.24), a varibelt motor ($132.90), a fuel oil tank ($173.39) and a bench grinder ($108.88).

REPAIR AND MAINTENANCE

Budget - $800 Actual - $1,311.59 Difference - - $511.59

Some of the larger items which required outside help for repair and maintenance include labour and materials, inspection and repair to the heating system by Martin Bros. ($140.46),

labour and materials for welding the boiler and replacing piping between the return sludge pump and boiler by R. T. McBride ($69.78) and painting the digester, digester control room, basement floor of the pump room, pump room and floor, boiler room and the interior of the two valve houses of which $875 was paid in December. The remainder of the paint bill will be paid in 1963 when the interior of the valve houses are completed.

SLUDGE HAULAGE

Budget - $9,400   Actual - $7,840.00   Difference - +$1,560.00

The budget for $9,400 was based on the 1961 expenditure of $9,150.50. However, this year the sewage strength and flow dropped 19 and 18 percent respectively with the result that there were 440,021 gallons less raw sludge this year than in 1961. The digested sludge was also decanted this summer resulting in a further reduction in the amount of digested sludge to be hauled. Less sludge in 1962 than in 1961 plus the fact that there was decanting of the digested sludge in the summer accounted for the difference of $1,560.00 between the budget and actual expenditures.

SUNDRY

Budget - $1,300   Actual - $1,976.42   Difference - -$676.42

Items purchased include wipers from Canadian Linen, shipping charges, Bell Telephone rates, Sunshine Uniforms, Workmen's Compensation ($88.08). The largest item under Sundry is for labour to uncover, remove and replace the fuel tank ($155.90).

WATER

Budget - 0 Actual - $548.55 Difference - - $548.55

The total operating cost per capita for the citizens of Stratford during the year amounted to $2.35 with an average of 20 cents per month. It cost on the average 3 cents per pound of BOD removed, 3 cents per pound of suspended solids removed and $73 per million gallons of sewage treated.

During the year, $1191.33 was spent from the reserve for contingencies for the paving of the roadway into the plant. The reserve for contingencies on December 31, 1962 was $32,514.51.

The following table shows the monthly project operation statements:

OPERATING BUDGET AND EXPENSES 1962

MONTH	EXPENDITURE	PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICAL	GENERAL SUPPLIES	EQUIPMENT	REPAIR AND MAINT.	WATER	SUNDRY	ACTUAL	BUDGET
JANUARY	1800.93	1288.90	278.00	30.96		54.38	113.79		11.50		23.40	1801	4,583
FEBRUARY	2591.00	1637.81	254.96	45.23	416.34		55.02			21.34	160.30	4392	9,166
MARCH	2676.07	1559.12	254.96	75.49	387.18		69.21	103.55		19.21	407.75	7268	13,750
APRIL	3196.22	1559.12	254.96	43.67	413.21		197.75			50.80	676.71	10464	18,333
MAY	3847.56	1587.10	268.70	72.50	391.50	22.64	156.72		35.67	50.80	1261.84	14312	22,916
JUNE	3806.81	1350.44	491.68	120.37	377.35		285.32	80.34	15.00	50.80	1035.51	18119	27,500
JULY	4370.21	1785.95	487.31	30.20	376.16	8.66	263.55	75.24	205.46	50.80	1086.88	22489	32,083
AUGUST	5217.01	2790.29	359.62	65.49	429.41	51.13	94.15	132.90	18.00	50.88	1225.22	27706	36,666
SEPTEMBER	3249.44	1863.90	220.36	119.99	376.68	2.20	428.20			50.80	187.31	30956	41,250
OCTOBER	4959.10	1863.90	231.92	31.65	403.38		803.07	282.27	98.18	50.80	1193.93	35916	45,833
NOVEMBER	4338.87	1863.90	243.36	249.25	461.81		81.43		5.65	50.80	1382.67	40254	50,417
DECEMBER	7904.34	4012.22	324.76	151.95	965.30	2.90	248.67		922.04	101.60	1174.90	48158	55,000
AVERAGE	4013.16	1930.22	305.88	86.40	416.53	11.83	233.07	56.19	109.30	45.71	818.04	4013	4,583
TOTAL	48157.96	23162.65	3670.59	1036.75	4998.32	141.91	2796.88	674.30	1311.59	548.55	9816.42	48158	55,000

* SUNDRY INCLUDES SLUDGE HAULAGE FOR $7,840.

RECOMMENDATIONS FOR FUTURE DEVELOPMENT

The painting of the valve house interiors will be completed in 1963 to terminate the paint contract. Counter weights and a differential bubble control will be added to the barminutor to reduce the strain and wear on it. It is planned to drain and clean out the sludge in the reaeration section next year as the sludge has accumulated to such an extent that is beginning to impede the efficiency of the diffusers. It is also planned to review the data concerned with the aeration section of the plant in order to find out if some of the aeration units can be successfully removed from operation.

The plant will again be supervised closely during the year to ensure it operates at its peak efficiency.